

Value Adding to Northern Territory Copper: 1901-1910.

By VALERIE FLETCHER

Between 1901 and 1910 South Australia oscillated between handing over its dependency, the Northern Territory, to the new Commonwealth government or continuing to administer it and complete the proposed north/south transcontinental railway. The Territory's uncertain future was added to the existing difficulties copper mining experienced. Although the main problems were isolation and lack of infrastructure, the industry also suffered from excessive South Australian railway charges added to cartage to the railway and freight costs from Port Darwin to the New South Wales smelters, extremes of the wet and dry seasons and a harsh terrain. The lack of adequate infrastructure and the high cost of transport meant only better quality base metals were exported. Nevertheless, during this decade two copper smelters were built, at Daly River and at Yam Creek, the first government funded and the other an English company investment. The uncertainty of the Territory's future, local conditions, parsimony of the distant administration and disregard of local advice - all led to only partial success for these projects.

Northern Territory infrastructure

The distance by sea between Port Darwin and its administrative centre, Adelaide, was 3,936 nautical miles. Two steamer companies ran monthly ships from Hong Kong to Sydney (sometimes extending to Adelaide) that called into Port Darwin. The poorly conceived wooden railway jetty was out of commission through toredo worm and termite damage. The new jetty would not be completed until 1904. There were government launches that ran to coastal centres when required. Adelaide and Darwin, 1,638 miles apart, were connected by telegraph that joined with the British Australian Telegraph cable to Java. It had been intended that a land-grant transcontinental railway connect these two Australian centres but, as construction of the telegraph line had proved more difficult and expensive than anticipated, this project had been shelved. By the late 1880s two government railways were built from Adelaide to Oodnadatta in South Australia's dry interior and from Darwin to Pine Creek (146 miles south) in the mineral district of the Northern Territory, with the intention of joining them in the future.¹ Territory rail freight rates were double and more than those in the South

Australian section of the railway. There were no formed roads only dirt tracks, mainly along the telegraph line.

Northern Territory mining

Payable gold had been discovered while digging postholes for the telegraph line and a short gold rush had followed. In 1872 the South Australian government issued Northern Territory goldmining regulations enabling a local warden to issue miners' rights and register mining claims. A miner's right cost £1 a year entitling the holder to an alluvial claim 25 yards squared; a quartz claim cost £1 per acre per year.² In 1874 indentured Chinese were brought to the Territory to assist in mining and, as a European expected and obtained £4 to £5 weekly, European leaseholders began to tribute their mines to the Chinese and they soon dominated gold mining.³ Late in 1888 mining laws were changed to require the expenditure of £5 per acre or the employment of one man for each 20 acres. Mineral licence holdings were restricted and sale of leases for non-working would in future be by public auction.⁴ After the spectacular success of Western Australia's Coolgardie and Kalgoorlie gold discoveries, English companies also invested in Northern Territory mining in the 1890s.

The first base metal discovered was tin at Mount Wells in 1881. Among other base mining operations, silver was mined at Eveleen Silver Mining leases and a water jacket furnace for silver/lead constructed. Despite smelting difficulties and high wage and salary costs, the introduction of iron flux enabled the smelter to put out two tons of bullion daily. It closed in 1891.⁵ Two reports, J.E. Tennison Wood's 'Geology and Mineralogy of Northern Territory' in 1886 and J.V. Parkes's 'Report on Northern Territory Mines and Mineral Resources' 1891, wrote respectively: 'I do not believe the same quantity of mineral veins of gold, silver, tin, copper and lead will be found in any equal area in Australia' and 'I have no hesitation in saying ... that the Northern Territory of South Australia is phenomenally rich in minerals'. Two miners from the early gold rush, Messrs Houschildt and Roberts, found copper 'of unusual richness' near the Daly River in November 1892.⁶ Just before Aborigines in 1894 murdered all at the mine except Roberts, it had been sold to a Sydney syndicate.⁷

Copper Mining and a Government Copper Smelter for the Northern Territory

The Daly River Copper Mine, a 30-acre property held under mining lease, was about five miles from the Daly River at the highest point of navigation. At that time the area was about 230 km from Port Darwin by rail and road during the wet season when the river was flooded or subjected to dangerous currents.⁸ The syndicate that purchased the mine let a contract to E.

Marker to raise 2,000 tons of copper and deliver it to Newcastle, New South Wales, for £7.10s a ton.⁹ Marker lost considerably on the deal because only copper over 20 percent would pay to be shipped; and the price of copper fell in 1897/1898. The cost of carting the ore at that time was 10s per ton from the mine to the river, 25s from the river to Port Darwin and a further 25s to ship from Darwin to Newcastle.¹⁰ By the time the mine was sold to a local syndicate some 2,000 tons of handpicked 25 percent ore had been exported, reportedly valued at £25,000.

Copper had been profitably mined in South Australia, with Burra Burra, Kapunda and Moonta being the better of the copper shows; and the Minister for the Northern Territory displayed an interest in building a copper smelter in the Territory in 1900 if ore output warranted the expenditure. But this output could be erratic because price and freight costs bore strongly on the viability of production and it was already noticeable that when prices fell or freight rates increased production declined substantially. The 1901-1910 prices of copper were variable: from £70 per ton (1901), £51.5s (1902), fluctuating between £52.5s and £67.5s (1903-4), increasing in 1905 until it reached £100 (October 1906) and remaining around that figure until the end of May 1907. After that there was a gradual but consistent fall in value until it hovered between the high £50's and low £60's where it remained until the end of 1910.¹¹ In August 1901 the Northern Territory parliamentary representative in the South Australian parliament, C.E. Herbert, moved that the government erect smelting works at or near Port Darwin. The government struck out 'smelter works' and added 'reverberatory furnace' before agreeing to the project. This was probably to reduce the ore to the intermediary stage of regulus, thus reducing freight rates but saving the cost of completing the smelting process. The choice of site is understandable because Port Darwin was the terminus of the government rail line from the mineral district and there were government railway workshops at the Two and a Half Mile (present day Parap).¹²

An English company smelter

Nineteenth century English capital invested in the Territory had never been sufficient to develop the mines properly, especially as much had been wasted in sending out machinery from England that was often unsuited to local conditions. Specialists to operate and repair these were often unavailable. Another problem was that above ground facilities and even luxurious accommodation were often built before underground development was properly undertaken and mines adequately tested. Moreover, the distance of the Northern Territory from the London headquarters encouraged speculators (and even the unscrupulous) in

London to exaggerate assay results to their advantage but to the detriment of development. Added to this were the local problems of harsh environment, extremes of wet and dry seasons, refractory ore, isolation, and high costs (especially transport). Yet the capital invested did improve conditions in the mining area, provided employment and tested the mines even if less adequately than desirable. Those English mining companies that mined more seriously underestimated the problems and were overcome by inadequate capital.

Photograph 1: *Manhandling buggy across corduroyed timber crossing. Illustrating some of the transport problems in the Daly River area.*



Source: Federal Parliamentary Visit 1912 Collection, Northern Territory Library. PH0100/0108.

Although the inadequacies of the English mining companies were not confined to the Northern Territory or even to Australia, but were part of ‘a world-wide scene of speculation which centred on the City of London’ between 1894 and 1904,¹³ the Bottomley companies in the Northern Territory were particularly notorious. Even before his companies invested in the Territory, Horatio Bottomley had been charged with fraud in England (1893), conducted his own defence and been discharged. At the end of 1907 he was tried for intention to defraud and again successfully defended his case. In 1922 he was successfully prosecuted and given a term of seven years.¹⁴ The Northern Territory Goldfields of Australasia, in which he played a prominent part, bought goldfields wholesale and, through exaggerated assays and

hyperbolic reports persuaded investors to purchase individual mines at a large profit while soft-talking his shareholders into reconstructions of the original companies. By 1901 he announced that he had not held any interest in the Northern Territory Goldfields Company for two years. This issued in a new era for these mines. A director, J. McDonald (who had examined mines in various parts of the world) came to the Territory and until his death in 1905, appeared seriously to attempt to develop the mining leases. After another reconstruction in 1901, the company concentrated its efforts on several of its many fields including the Howley goldmine, the Iron Blow mine and later the Mount Ellison copper mine, with some level of success.

At the end of 1902 the company decided to erect a forty-ton water jacket furnace and a reverberatory furnace for roasting copper matte. In December an extraordinary meeting of the company, under the chairmanship of McDonald in London, wound up the existing company and a new company, Northern Territory Mining and Smelting Company, was formed to work the properties.¹⁵ Despite adverse publicity, all the shares in the new company were taken up. McDonald had high hopes of the Iron Blow believing it would yield ore to the value of £100,000; and the price of copper was beginning to rise.¹⁶ In May 1903 *s.s. Charon* left Liverpool directly for Port Darwin with rails and rolling stock for the Mount Ellison-Yam Creek railway, a 60-70 tons capacity water jacket furnace, ironwork and fire bricks for two fifteen-ton reverberatory furnaces, both Robey tubular and Babcock and Willcox boilers, a mill, a briquetting stack, blowers and all other necessary plant, thousands of tons of best Welsh coke and a Mr Griffiths, who was experienced in erecting smelting furnaces. Labour difficulties began with finding sufficient workers to unload *s.s. Charon* and multiplied when unskilled Chinese labourers had to be hurriedly trained to work the furnaces.¹⁷

South Australian parsimony and intransigence regarding the government furnace

In the meantime, the government reverberatory furnace was ready for construction at the Two and a Half Mile in Darwin, but miners had ceased mining for copper because the price had fallen to between £51.5s and £52.5s. Moreover, the government had decided to pay on assay only 50 percent of the estimated value instead of the 75 percent originally promised; and miners claimed that this new return would not pay expenses to that point of production.¹⁸ On the South Australian government's instruction, the government resident circularised miners reminding them that they had petitioned the government for the smelter.¹⁹

The government's newly appointed smelter manager, F.W. Bice, finding miners complained of the lower price of copper and the small government advance,²⁰ forwarded to the southern authorities an expansive list of the mining costs and charges facing the miner to the point where the ore reached the smelter and factored in a variety of prices for copper and grades of ore. He proved that the miner would face a substantial loss to that point on a 50 percent payment.²¹ He had earlier warned the South Australian administration that the Yam Creek smelter might be constructed; and had advised them to come to some binding arrangements with that company for the treatment of custom ores at southern rates. This could be achieved by granting them a small subsidy or by reducing rail freight for fuel and product, if the English company erected their smelter within a given time. He had also advised that, should the mines at Daly River or Borroloola warrant a smelter being erected, it would be advisable to build the proposed government smelter at either place.²² He then forewarned that the miners would wait until the English company's smelter was built. A ministerial return telegram to the government resident advised: 'Regret unfavourable prospects. Furnace however is to be built as originally resolved'.²³ At approximately the same time the government resident received two letters from E.H.T. Plant of Charters Towers, who had advised the English company, *inter alia*, to erect the smelting plant and build the tramline to Mount Ellison. He enquired, on behalf of the English company, whether a smelter was to be erected at Port Darwin and whether,

[i]f the Northern Territory Gold Mine Company erected copper smelters at once at Yam Creek to smelt for themselves and the Public, would the government sell the material being prepared for Port Darwin works, and also grant a subsidy, and what amount could this be towards the works at Yam Creek.²⁴

This is an example of the intransigence of South Australian administration because the government reverberatory furnace was still erected at the Two and a Half Mile in Darwin. In January 1903, Bice advised that no ores had arrived and warned that it was unwise to start smelting until 180 tons of ore were ready for treatment.²⁵ Unless the crown of the furnace became glazed with successive charges and was a homogeneous mass, there could be considerable damage in cooling.²⁶ He suggested the government secure some copper claims near the short Darwin-Pine Creek government railway to provide a definite supply to the smelter.²⁷ The failure of this scheme would lead to the abandonment of the Two and a Half Mile site. Bice did not only advise the Minister but also travelled widely during this period

‘within a reasonable distance of the railway line’, inspecting mines and abandoned sites for both copper lodes and sulphide ore supplies.²⁸

A Local Proposition

In eight months only 60 tons of ore came forward, some from the Daly River where handpicked 20 to 38 percent copper ore had been shipped to New South Wales smelters since 1888.²⁹ All ore of less than 20 percent had been thrown aside and it was reported that there were many thousands of tons of this rejected material there that would not pay to transport to Port Darwin.³⁰ Although exaggerated, Bice calculated it to be 13,900 tons averaging nine percent.³¹ A.E. Jolly, H. Clark, V.V. and S.T. Brown and G. McKeddie - all Territory mine owners - offered certain guarantees, land and assistance if the reverberatory furnace were resited at the Daly River.³² Copper prices had now risen to £57.2s.6d. The government accepted the offer provided there was an increased smelting charge of 1s.3d and the cost did not exceed Bice’s estimate of £500 as well as a £25 bonus to furnace-man, J. Thomas, on completion of the work. The Two and a Half Mile site was abandoned.³³

Rebuilding the smelter at an isolated, difficult place during the Wet season

The Daly River was approximately 100 miles from Darwin by sea and river. In those days:

Mails and light stores came by road from the railway at Brocks Creek in the Dry season but all heavy stores had to be brought from Darwin by boat. There were no regular river services at the time, and all voyages had to be specially arranged [sic] and loading to value of 60 pounds guaranteed [although there was the occasional sampan trading along the river³⁴]. During the Wet season all transport ceased, and the only possible means of communication was to arrange for an Aboriginal to walk to Brock’s Creek with a message. This took three days.³⁵

On a number of occasions, it is recorded, Aboriginal hunters supplied the only food available to Europeans; and the Chinese had to resort to eating roots.³⁶ When product was later exported from the smelter, this situation improved as luggers visited more regularly.³⁷

In October 1903 there was no time to be lost in getting the smelter materials to the new site before the Wet set in. But 1904 was the year when Brocks Creek (71 miles from the smelter site) had its record wet season. Bice went south on sick leave and Thomas struggled on.³⁸ Materials did not arrive in the correct order although Thomas had laid them on the Darwin jetty and indicated which were required first. Then, with the swollen state of the Daly River and roads that had closed in, wet season difficulties caused long delays through the

absence of essential materials, especially when even the Aborigines refused to carry galvanised iron from the closer, but abandoned Daly River Mission to the smelter site.³⁹ Adding to the difficulties, Bice was granted an extension of leave and some men left because their rations ran out. Finally, towards the end of April, the smelter shed was completed but heavy rains continued.⁴⁰

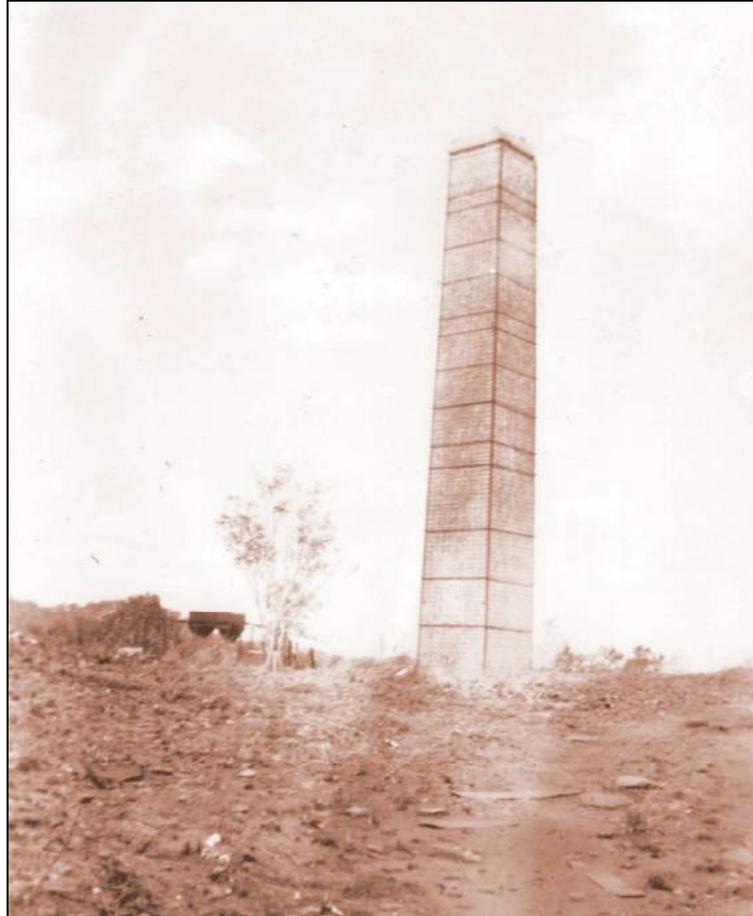
The return of Bice at this time did not end the difficulties: the river was still too high to land bricks at the landing and they were deposited eight miles below this point; sickness broke out among the men and bricks smashed in transit had to be replaced with supplies from the south. In August, when the furnace was completed, there were no men to work it; and in October - a year from the decision to move the smelter - the works had to be closed almost immediately because some men refused to work (probably because isolation, periodic bouts of malaria fever, harsh conditions and delays had discouraged them. It is known that some men were sacked for taking to drink and at one stage there was a strike).⁴¹ Towards the end of October some matte was ready for shipment. It was decided the 60 tons of copper ore and lime still at the Darwin Two and a Half Mile site should be shipped back to the Daly River for treatment.⁴²

Progress of the English company's smelter at Yam Creek: success despite problems

While the government reverberatory furnace was being resited at the Daly River, all appeared to be going well with the English company smelter at Yam Creek despite their difficulties. As well as four shillings a ton duty on the imported coke, the company considered the government railway charges were 'exorbitant'.⁴³ The manager tried to substitute wood for the expensive coke in some operations. The record 1904 wet season, however, caused difficulty in getting sufficient dry wood and fuel for the furnace as well as causing flooding in the mines.⁴⁴ Despite this, it was claimed the new local manager, H. Roberts, was a good practical man who worked untiringly with limited means in the interests of shareholders 'pushing things along for all he was worth'.⁴⁵ Capital of £60,000 was invested. It was discovered that the Mount Ellison ore formed an admirable flux for Iron Blow ore; and, despite low yields, Howley gold paid sufficient to cover management expenses. Several large shareholders in the English company, at their own expense, had sent a Melbourne mining engineer, F. Jolly, to examine the properties and the report dated 8 March 1904 began: 'My impression is very favourable ...'; the Iron Blow ore assayed an average of 7 percent copper, 9 ozs 4 dwt 5 grains per ton silver and 2 dwt 14 grains per ton gold and Mount Ellison ore averaged 22 percent copper and 8 dwt per ton silver. On his exploratory trips while the government

smelter was in Darwin, Bice had already noted the ‘splendid body of smelting ore at Yam Creek’ that contained ‘fluxing properties which will reduce the cost of smelting below what it could possibly be treated’ at his Two and a Half Mile smelter.⁴⁶

Photograph 2: *Stack at smelters at Grove Hill, used for smelting by Ironblow Mine and some other mines. Photo taken in 1940's*



Source: M.R. Bradbrook Collection, Northern Territory Library, PH0402/0015

By June 1904, railway trucks began bringing copper matte to Darwin for shipment overseas: 44 tons valued at £4,250, 60 tons valued at £5,000; and the chairman predicted monthly returns of £10,000. He also anticipated by the end of the year the company would at least double its ore reserves as the Iron Blow was to be opened to the 200-foot level during August. It was decided to increase the number of smelters. Roberts' report was optimistic and the company's assayer, claiming that experiments had been carried out, was sanguine. The *Eastern* arrived in Port Darwin with 30 Europeans under engagement to the company. Herbert in South Australia's House of Assembly quoted a letter from Roberts explaining their success and the number of expected Europeans (100) who would be employed when another

furnace and a complete converter plant (for bessemerising copper matte and producing copper bars) were erected. Yam Creek had become the most populous and flourishing up-country centre in the Northern Territory. There were six Chinese stores, several bakers, a Chinese restaurant for Europeans and a European branch store was about to be opened. In December the new plant arrived in Darwin.⁴⁷

Difficulties in operating the Daly River Government Smelter

The first smelting charge at the newly erected government reverberatory furnace at the Daly River caused the bottom to crack and this had to be replaced. Bice did not obtain a clean slag but continued because he believed this would improve when the furnace collected a little metal.⁴⁸ By 22 November 1904 Bice was having labour troubles that delayed the completion of the new bottom. Lack of equipment at the Daly River Mine also delayed sulphides delivery. Bice was forced to bypass the matte stage and produce copper directly. Every Daly River mine developed to sufficient depth had contained some sulphide minerals. An irregular vein of the required ore was found and all labour concentrated on mining this. Europeans, Chinese and Aborigines were employed, the Chinese receiving low pay rates and the Aborigines only rations; and even these were repeatedly running short with frequent requests to the government resident for supplies.⁴⁹ Bice gave a month's notice in November and advised that, as there were not sufficient sulphides coming to hand to make matte, rather than smelt, the men should concentrate on building a tram line and acquiring all the necessary ores, wood and fluxes as well as manufacturing charcoal.⁵⁰ The *Northern Territory Times* criticised his decision.⁵¹ An examination of the complex revealed mistakes had been made: poorer local bricks had been put on the inside instead of the outside of the reverberatory furnace; the firebrick wall ought to have been built in with the crowning, not separately; the stack was built nine feet instead of the necessary 20-30 feet from the furnace; and, generally, there was bad workmanship in the original buildings. The Daly River Copper Mine proprietors, who had sunk their capital into the removal of the reverberatory furnace to the Daly River, were frustrated as they had 2,300 tons of first class ore awaiting treatment.⁵² By the 25 January 1905, although the sulphides were not yet strong, there were 150 tons ready and 2,000 to 3,000 tons on the surface of the Daly River Mine to be picked and dressed; and activity at the other mines was promising.⁵³ The government resident inquired of the Yam Creek smelter manager, whether an assayer (J. H. Niemann) and a smelter captain (J Webber who had been with the smelter since its inception) could do the work of a manager. This elicited the reply, on the authority of the visiting English metallurgist and mining engineer, a

Mr Grace, that 'a crucible smelting forms a reliable guide for preparing the charges for a reverberatory furnace'.⁵⁴

As the government was anxious to see operations resume, Niemann (a chemist and assayer) was appointed.⁵⁵ A new bottom was constructed and operations resumed on 28 May 1905. Shoddy bricks used in construction gave way in June and, after reconstruction, gave way again in August. Although 'no difficulty was experienced at any time at fluxing any of the ores' or making a liquid slag, the richness of the slag was the problem; and the Bice slags, too, had 'always contained 8.5 to 9 percent' copper.⁵⁶ Smelting copper then, as now, was a chemical process but, in the absence of computers, modern equipment and processes, Webber and Niemann experimented tirelessly in the tropical heat, 'with men working harmoniously', in an attempt to reduce the copper in the slags.⁵⁷ After experimenting with various combinations of ores and fluxes, they obtained slags containing 6 percent to 9 percent copper. Yet Niemann could produce 'metallic copper and a clean slag' in the crucible.⁵⁸ Mr Grace's advice did not appear to work with the refractory Daly River copper ores in this reverberatory furnace. 'It was assumed that kaolin in the ore [had] the effect of holding the beads of copper in suspension'.⁵⁹ Generally, Daly River copper occurs

in a north striking belt of intermediate to acid volcanics, cherty chloetic shales and tuffaceous siltstones of the Warrs Volcanic Member of the Early Proterozoic Burrell Creek Formation.⁶⁰

The Daly River Copper Mine ore was from the secondary zone 'where malachite, azurite and chalcocite' were the main ore minerals'.⁶¹ As these were oxides of sulphur, successful smelting required sulphides (that came from deeper underground) as a fluxing and reducing ore, and an expert who had experience in working with kaolin. More suitable sulphides would need to be brought from mining areas nearer Pine Creek (carting these from mine to train to lugger, to the landing and thence to the smelter).⁶² Webber considered that at least nine percent sulphide ore was needed to make matte with a clean slag.⁶³ The price of copper was now £68.15s and rising. Much as the gentlemen then in charge were admired locally, it was obvious more special knowledge was needed. It was four years since the government had agreed to build a reverberatory furnace in the Territory. In the meantime, mine owners continued to hand pick their richer ores and export them to Newcastle; mine development practically ceased and Chinese tributers were employed to raise the copper ore. Without success, Webber, supported by the new director of the Yam Creek smelter, advised the

government resident that a blast furnace would have succeeded where the reverberatory furnace had failed. Under the circumstances Webber proposed that the Daly River reverberatory furnace concentrate the ore to regulus instead of smelting it. If 10 tons of ore were concentrated to six tons of slag, miners would be able - taking freight into consideration - to make a profit on ores assayed over 9 percent whereas crude ore then needed to be at least 13 percent to pay.⁶⁴

Problems at the English Yam Creek smelter

All had appeared to be going well at the English Company's Yam Creek smelter in 1904 despite difficulties regarding the 'exorbitant' railway charges for 2,000 tons of imported coke plus four shillings per ton import duty; but this was not so. The English director of the Northern Territory Mining and Smelting Company, McDonald, returned to the Territory later in that year. In November 1904 the smelter manager, Roberts, 'resigned'; he had overestimated ore supplies and underestimated capital expenditure. McDonald supervised the operations for some months until a new general manager, T.J. Dyson, arrived early in 1905.⁶⁵

The *Bulletin* had predicted trouble on the grounds that 'nothing grows more luxuriantly in the Northern Territory than mining expenses'. The price of shares plummeted although this time mining pundits supported the company. They commented on the short sightedness of those who sacrificed artificially depressed shares. It had seemed certain that the reincarnated Northern Territory Mining and Smelting Company was a serious mining venture but, in his 1904 report, the government resident wrote that mining was entirely at a standstill and that the cause was the prohibitive price of land and water carriage to any treatment works.⁶⁶

In February 1905 McDonald reported locally that a reconstruction scheme had been successful; that operations would recommence as soon as the necessary preliminary arrangements were made; and that net working capital provided under the new scheme - after payment of all outstanding liabilities - would be £35,000. Before he left the Territory he had predicted the output for December 1904 would be £5,000, for January 1905 £6,000 and for succeeding months £10,000; but he had also recommended further expenditure of some £40,000 and later increased that amount. Nevertheless, he had also indicated that both more careful and economical management and certain concessions as to freight charges and other matters from the South Australian government were needed.⁶⁷ He did not live to bear witness to his suggestions, for he died in London on 24 November 1905.

Appeals to the South Australian Government for support

With the resumption of the South Australian parliament, the two Territory members tried to obtain railway freight concessions. V.L. Solomon, pointed out the difficulties of the mining industry, for:

wages for skilled European labour was about twice as high as in the settled districts in Victoria, Queensland and New Zealand; it was frequently difficult to obtain skilled labour because of its isolation; and freight charges on machinery, and even on the necessities of life, were enormously heavy, twice or, in some cases, three times as high as in South Australia.⁶⁸

The government could most assist the industry with rail freight concessions. He pointed out the railway had not been built as a local railway but as part of a transcontinental scheme and the other Territory representative, S.J. Mitchell, later added that, had it been built as a local railway, a different route would have been taken. The position of the Northern Territory Mining and Smelting Company was then expounded:

£100,000 already spent in legitimate mining;
£14,000 worth of machinery in Darwin [awaited] transportation to the smelter site;
and ... the company had been one of the strongest and best customers of the railway.

It had spent £2,510 in freight alone since the end of 1902, as well as £600-£800 duty on machinery and hundreds of pounds duty on coke, together with wharfage rates at double and more such rates in South Australia proper. To prove the *bona fides* of the company, Solomon explained that 10,500 tons of ores were smelted for 286 tons of copper matte valued at £27,000 and then sent to Darwin by rail at £1.8s.3d a ton against 13s.8d per ton in the home state. He explained that before the new machinery would be taken to the smelting works the cost of carriage would have to be reduced. Formerly the company had employed from 200-250 men, now there were only 30 or 40 working. If the smelter were restarted and the machinery in Darwin erected on site, between 300 and 400 men would be needed. Although some freight concessions had been made on copper matte and coke in bags, 'further reductions would be necessary or the company would rather let the £100,000 go than put in another £60,000.'⁶⁹

The Commissioner of Public Works acknowledged that if anything were to be achieved in the Territory it would come from mining. The government agreed to submit the required items to the Railway Commissioner and request his favourable consideration. The Commissioner, A.G. Pendleton, was strongly opposed to any general reduction of rail-rates in

the Territory on the grounds that working costs were higher than in the southern province.⁷⁰ Nonetheless, Solomon's motion was carried without division.⁷¹ In the event, however, the new Labour government supported the Commissioner's view. Earlier Bice of the Daly River copper smelter had objected to freight concessions being given to the English company on the grounds that this, *inter alia*, 'will cause vital injury to the Government Smelter'.⁷²

In February 1906 it was reported that the Northern Territory Mining and Smelting Company was erecting the new 120 ton water jacket furnace and smelting would recommence at Yam Creek for three months only. The best of the sulphides together with the richer ore from the Iron Blow and whatever carbonates could be obtained from the Mount Ellison would be smelted. The local paper acknowledged that cost of pumping the immense volume of water, inferior quality fuel, scarcity and high cost of good mining timbers, excessively high railage on coke - among other costs - would make smelting of low-grade sulphides a doubtful proposition. In the first weeks of operation the smelter produced 70 tons of matte containing two ounces of gold, 80 ounces of silver and 40 percent copper; and it was working to its full capacity of 120 tons per day. Rumour had it that the ore in the Iron Blow was richer than reported. The *Times* believed the boring plant, then in the Territory, should be used to test Mount Ellison, to which mine an expensive tramline had been built.⁷³

Closure of the Private Enterprise Smelter

The Yam Creek smelter closed in June 1906 when the price of copper was rising towards £100 per ton. The General Manager, Dyson, announced that the possibility of profitable development of the company's properties - *under existing conditions* [emphasis added] - was not encouraging. He claimed the mine was not big enough, the ore at the Iron Blow mine was too variable, the layout of the smelter increased working expenses and there were continuing heavy expenses especially those of fuel and carriage. In three months it had smelted 6,500 tons of ore for an approximate gross return of £32,000.⁷⁴ Responding to a pound for pound subsidy, the English company was willing to invest another £500 on government boring operations on the Iron Blow. But the directors ordered discontinuation when the account reached £148.1s.1d, because hard rock was reached at 400 feet and no further carbons were on hand. Diamonds for the drill bits alone were costing 17s per foot of drilling.⁷⁵ The *Times* questioned Dyson's pessimistic view;⁷⁶ and the belief that his report was hastily written without adequate investigation persisted in the Territory. At an Ordinary General Meeting of the Northern Territory Mining and Smelting Company in London, August 1907, it was stated that - after deducting all working expenses from the time of formation - there was an

approximate loss of £1,700. Yet a point made at the meeting was that matte had realised a large excess value above the cost of production (presumably because copper prices had risen at the time of sale); but from the beginning of June 1907 the price of copper was beginning to fall.

Summary of the Yam Creek Smelter operations

There were Territory sources that supported the contention that closing the smelter may have been precipitate. The Chief Warden of the Northern Territory wrote that the manager's opinion, regarding the general refractory nature of the ores in the Iron Blow, was open to question and that there was a good probability - supported by the mine working plan - that the one English-company/government test bore had missed major contact with the ore body by passing through the broken lode formation at the northern end of the ore bodies. H.Y.L. Brown, South Australian government geologist, had already reported on the jumbled character of the brecciated lode. In a later boring operation report Brown wrote that the main reason for discontinuing the operation was wear and tear on diamonds. The Secretary to the Minister, Benda, had already criticised the official in charge of Iron Blow drilling for 'not knowing how to line or tube a bore'.⁷⁷ Others who worked at the mine, especially the superintendent of the English smelting company - George Buttle - supported these theories.

Buttle wrote long and bitterly to the *Times* contending that a junior official, and not Brown had inspected the mine; that the maximum width of ore bodies was greater than reported, that the sulphide ore bodies were becoming richer with depth and that the lode at the 200-foot level comprised a beautifully clean ore. He also questioned the supposed metallurgical difficulties - the amount of galena in quartz - and the total costs of production. Buttle was convinced that, from the arrival of the last general manager, there was a determination to close down the company's mine. He made a definite offer to the company: to take over the mine and plant in conjunction with a trained metallurgist and mining engineer. The company was to receive 10 percent of the gross value of the metals recovered; but the offer was rejected. The Northern Territory Mining and Smelting Company's leases were forfeited early in 1907. Some of the machinery was offered locally, some was shipped south and the rest became government property.⁷⁸

Government Smelter: success at a price

The new manager of the government smelter, E. Basedow, reached the Daly on 16 October 1905. He achieved success by using imported charcoal rather than the locally produced

product.⁷⁹ The government finally agreed to advance 75 percent on assay of copper delivered to the smelter; but repented almost immediately and returned to the 50 percent advance.⁸⁰ Basedow, in a letter to the Minister, wrote that the lack of capital was the reason the output of ore from the Daly River mines was not greater; and that this thwarted development and the ability to increase production. He also attributed nearly all difficulties he encountered to government parsimony and false economy.

Basedow considered that approximately 60-70 percent ironstone was needed for fluxing purposes and that employing an assayer instead of a metallurgist had caused most of the earlier problems.⁸¹ By the end of 1905 the 'smelter' was producing copper regularly and 3.25 percent copper, reducing to 2.4 percent, was escaping in the slags. He achieved his result, however, by smelting the ore directly into metallic copper instead of reducing it to copper matte and blister copper.⁸² This required much greater heat, took a longer time to effect and led to less frequent tappings. Tapping was a problem while this process was continued because the furnace was built for running matte. Also working expenses were higher and the effect on the smelter was ruinous.⁸³

Results of the New Strategy

Basedow's decision to smelt directly to metallic copper accelerated the deterioration of the reverberatory furnace. The broken bricks and mortar dump was larger than the slagheap. Local bricks had been used satisfactorily at the Yam Creek smelter for boiler settings and in the stack for the blast furnace; but those bricks were subjected to lower temperatures than those in the Daly River reverberatory furnace. Dyson, manager of the English smelter, had co-operated with the government resident regarding Daly River smelting problems; but the solutions were not always applicable to the poorly equipped government smelter.⁸⁴ On 2 March 1906, Basedow wrote that he had 'trouble keeping men', the heat at the furnace was unbearable and during 'the hot weather it was impossible to get the men to do their usual best'.⁸⁵ Stoppages continued, the stack had to be replaced April 1906, copper solidified around the tap March 1907, and in September operations were discontinued when the furnace sides collapsed.⁸⁶

A second government smelter at Daly River

Copper matte could only be produced in the government furnace with the aid of sulphides. In April 1906 Basedow wrote that the smelter had been inoperable for fifty days since early January and that two smelters would assist in more economical

operations (a proposition rejected before the government operations had begun). One manager, foreman and shift boss could supervise up to three furnaces and only extra labour was necessary (although keeping labour had always been difficult with stoppages, collapses and suspensions from work). A further advantage in having two 'smelters' was that a breakdown of one furnace would still allow smelting to continue.⁸⁷ Mine operators expressed willingness to increase their ore supplies and the government provided a subsidy for development work at the mines.⁸⁸ When rich copper was discovered at Mount Davis in 1907, a petition for a smelter was forwarded to the Minister Controlling the Territory because Basedow believed he could run both the Daly River and another in that vicinity.⁸⁹ To preserve the smelter it was decided, early 1907, with copper prices per ton around £100, to close the smelter until sulphide supplies could be obtained from Mount Diamond near Yam Creek. The Darwin agents for bagged smelted copper complained that introduction of outside ores would contaminate Daly River ores that were free from arsenic and bismuth and that, therefore, penalties would have to be imposed.⁹⁰ Cartage, wood and other charges increased but copper prices also rose until May 1907.⁹¹

It was decided that a new furnace was to be built and suitable material taken from the abandoned Yam Creek smelter.⁹² Basedow was absent on sick leave for five months in 1907 and the smelter captain, Webber, continued to receive, weigh and stack ore, wood and charcoal, burn limestone and prepare for the new structure, visiting the Pine Creek area in April 1907 to inspect mines and estimate transportation costs.⁹³ In November 1907 there was the usual scurrying to beat the Wet. Five luggers were carrying supplies for the erection of the new smelter and the agents, Jolly's, were awaiting the arrival of a sixth to carry the 25 tons of sulphide copper on order.⁹⁴

The second heavy Wet season of the decade and success of the new smelter

Each year the wet season caused some difficulties; but the 1907-1908 Wet caused widespread floods that prevented the completion of the second 'smelter' until May 1908.⁹⁵ The expected economies of scale did not eventuate when the original furnace broke down beyond repair a few weeks after the second was completed. The government resident report concluded that, at the rates being charged for smelting, the operation must result in a loss.⁹⁶

By November 1908 a trial charging of the new furnace led to eminently satisfactory results and the smelter ran for eight months in 1909 with few stoppages for minor repairs. Disagreements between the government and the owners of the Daly River Mine regarding

smelting costs and the wording of the original agreement had already occurred.⁹⁷ In September the ever-present Webber applied for one month's leave on full pay but it is not recorded if it was granted.⁹⁸ By late November 1909 another recurrent problem (the supply of firewood) occurred. This problem of insufficient firewood became the 'last straw', and with the price of copper hovering around £60 the smelter closed in 1909.⁹⁹ While the government resident blamed the manager's unreliable estimates of firewood requirements as much as difficulties with the contractors for the problem, he also noted the manager's explanations. These were that that heavier consumption of wood was caused by the refractory nature of the ores and also the continual closing down of the smelter that caused a waste of wood in reheating when smelting resumed.¹⁰⁰

An assessment of the government smelter operations

A value-added industry had been intermittently in operation in the Territory for five years. The government had supported the industry but its rigid economy and spurning of informed local advice limited the project's effectiveness.¹⁰¹ Jones condemned the mine owners because it was at their instigation that the smelter was moved and they did not honour their agreement to develop the mines and supply sufficient ore to keep the smelter busy. Chinese tributers conducted most mining operations but with little mine development. The local mine owners had made limited efforts to sink to the sulphide zones of their own mines.¹⁰² There were mitigating reasons for this apparent failure: the 50 percent payment on assay gave no capital for development. Their financial situation was also adversely affected when the more easily smelted ores from the Empire Copper Mine (a South Australian-owned syndicate known locally as 'Bice's') received precedence. This caused dissatisfaction, especially as the local Daly River syndicate had subsidised the removal of the 'smelter' to the Daly River. Their more refractory ores, which might have been delivered and reimbursed earlier, could be locked out for years, further limiting their capital.¹⁰³

On the more positive side, in 1906 a constable had been posted to the isolated Daly River determined to prevent European or Chinese ill treatment of the Aborigines, thus enabling the two local tribes to assist in smelter operations without interference from other tribes. They hand picked ores for export, carting these from mine to river, and they provided a carrier-service from the smelter to the railway at Brocks Creek.¹⁰⁴ A Mechanics Institute was organised and 'when lighted up of an evening', with some people playing cards, others reading or arguing politics, 'it presented an attractive aspect'.¹⁰⁵ The earlier health problems had been mitigated when Basedow, at the new Government Resident Herbert's instigation,

had kerosene poured on stagnant waters and insisted that his men took precautionary doses of quinine. Basedow, at the farewell to Webber, was able to express regret at the imminent breaking up of their happy little community. The worst of the pioneering difficulties had been overcome. It had reinforced that what the Territory needed was capital to attract people and pay for infrastructure that could lead to the development of local industry. For a short time, as in the case of the Yam Creek smelter and at other English-owned mining centres, the introduction of finance had created communities such as this at Daly River.¹⁰⁶

Summary of the attempt to value add: 1901-1910

These two projects sincerely attempted to value-add to Northern Territory mining and to assist smaller mining groups who could mine for copper when prices were rising. The Territory was so isolated, with little infrastructure and with a climate of extremes. Its administration in Adelaide was deaf to local advice and reluctant to give support to entrepreneurs at crucial times. It was anxious not to increase the mounting debt and uncertain whether to devolve responsibility for this large, difficult area to the Commonwealth or to attempt to end its isolation by encouraging English capitalists to complete its proposed north/south transcontinental railway by the land-grant system. During this decade the South Australian government had attempted both remedies at different times. It had offered the Northern Territory to the Commonwealth in 1901, but had second thoughts on the matter and passed the *Transcontinental Railway Act* in 1902 under which capitalists were invited to build the railway in exchange for blocks of land in a draughtboard pattern similarly to the way transcontinental railways had been built in America. South Australia had postponed the transfer of the Territory to the Commonwealth in 1903 and succeeded in obtaining an offer to build the railway in 1906. This land grant transcontinental railway was considered another means of encouraging people, capital and industry to the Territory, especially as the syndicate constructing the railway would endeavour to develop its own blocks of land. The incoming Price Labour government opted instead to accept the Commonwealth offer to take over the Territory in 1907. The Commonwealth agreed to complete the Adelaide-Darwin railway but did not provide a date for its completion. On 1 January 1911 the Northern Territory became Commonwealth territory and future support for its mining industry and any government value adding would be the Commonwealth's responsibility. But that is another story.

Endnotes

- ¹ J.Y. Harvey, 'Palmerson and Pine Creek Railway', *The Australian Railway Historical Bulletin*, no. 364, p. 28.
- ² T.G. Jones, *Pegging the Territory: the history of Mining in the Northern Territory 1870-1946*, Darwin, Government Printer, 1987, p. 56.
- ³ J.E. Tenison Wood, 'Geology and Mineralogy of Northern Territory', 1886, p. 6; South Australian Parliamentary Papers [hereafter SAPP] 122/1886, p.1; Jones, *Pegging the Territory*, p. 76.
- ⁴ *Ibid.*, p. 77.
- ⁵ *Ibid.*, p. 83
- ⁶ Tenison Wood, 'Geology and Mineralogy of Northern Territory', p. 5; SAPP 122/1886; J.V. Parkes, 'Report on Northern Territory Mines and Mineral Resources', 1891, p. 10, in SAPP 32/1892: some early shipments were '145 tons yielded 31 percent copper per ton, 75 yielded 30 percent and 100 tons gave 38 percent'; Aerial, Geological and Geophysical Survey of Northern Australia, AG & GS of N.A. papers, Paper 19, Commonwealth Government Printer, Canberra, p. 2, located at Mineral & Energy Information Centre, Darwin, NT.
- ⁷ Parkes, 'Report on Northern Territory Mines and Mineral Resources', 1886, p. 10, SAPP 32/1886.
- ⁸ P. Forrest, *The Spirit of the Daly*, Daly River Community Development Association, 1994, p. 35.
- ⁹ J.V. Parkes, 'Report on Northern Territory Mines and Mineral Resources', p. 10, SAPP 32/1891; Forrest, *The Spirit of the Daly*, p. 36.
- ¹⁰ Parkes, 'Report on Northern Territory Mines and Mineral Resources', p. 10, SAPP 32/1892; Government Resident Correspondence [hereafter GRIC] 12273. [Note: The GRIC were correspondence received in Darwin by the Northern Territory government resident who was a South Australian appointed to administer certain specified matters in the Top End of the Northern Territory and to refer other matters to the South Australian minister in charge of the Northern Territory].
- ¹¹ These figures are compiled from the weekly figures cabled from London and published in the *Northern Territory Times* [hereafter *NTT*].
- ¹² *Ibid.*, 12 October 1900, 21 December 1900; C.E. Herbert, South Australian Parliamentary Debates, House of Assembly [hereafter SAPD], pp. 192-4, 21 August 1901, 11 August 1901; Chief Secretary, SAPD, p. 565, 16 October 1901; GRIC 10549; reports by J.V. Parkes & the Reverend J.E. Tenison Wood stated quantities of both tin and copper existed.
- ¹³ M.H. Tamblyn, *Mines, Money and Men*, Perth, 1988, pp. 1-4.
- ¹⁴ Jones, *Pegging the Territory*, pp. 99, 112.
- ¹⁵ *NTT*, 18 January 1901, 12 July 1901, 15 December 1905, 5 September 1902, 6 February 1903 and *passim*; Government Resident Report [hereafter GRR – Location State Archives, Darwin] 1901; 'Bottomley', *Sun* (London), 8 May 1901, cited in *NTT*, 19 July 1901; GRIC 11941, 11948, 12021, 13535 - extract from Mc Donald's speech in *Mining World*, 21 March 1903.
- ¹⁶ GRR 1902, GRIC 13535, reprinted report from the *Mining World*, 21 March 1903.
- ¹⁷ *NTT*, 29 May 1903; S. Mitchell, 'An Archaeological and Historical Survey of Selected Mining Sites in the Pine Creek District, Northern Territory', A Report to the National Trust of Australia, Northern Territory Branch, 1994; M. Tamblyn, *Mines, Money and Men*, p. 57.
- ¹⁸ GRIC 11603, 17 October 1902; *ibid.*, 11941, 11955, 11958, 12021; *NTT*, 26 September 1902, 3 October 1902, 24 October 1902, 1 May 1903, 3 April 1903, 16 October 1903.
- ¹⁹ GRIC 11603, letter to those who had signed a petition dated 17 October 1902, also petition dated 16 September 1901.
- ²⁰ GRIC 12194, Bice to GR.
- ²¹ GRIC 11591, Bice to GR, 2 October 1902.
- ²² GRIC 11395, letter dated 7 July 1902.
- ²³ GRIC 11395, telegram 5 August 1903, Minister to Government Resident.
- ²⁴ GRIC 11512, letter from Plant to GR, 5 August 1902.
- ²⁵ GRIC 11649, 12000, 12003, Bice to GR.
- ²⁶ GRIC 11942, letters: 15 March and 23 March 1903.
- ²⁷ GRIC 12026, 12234.
- ²⁸ GRIC 11395, 12194, 12247.
- ²⁹ GRIC 12000: Parkes, 'Report on Northern Territory Mines and Mineral Resources', 1891, p. 10.
- ³⁰ Parkes, 'Report on Northern Territory Mines and Mineral Resources', 1891, p. 10.
- ³¹ *NTT*, 31 July 1903, 28 August 1903, 18 September 1903; GRIC 12273, Bice, letter 10, September 1903.

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- ³² GRIC 13954: Memorandum of Agreement to be in operation for a period of three years from the commencement of operations at the Government Smelter.
- ³³ GRIC 12273, 11395, telegram and two letters from E.H. Plant, 5 & 16 August 1902, 11649, 12003, 12046, 12273, Bice letter dated 10 September 1903; *NTT*, 31 July 1903, 14 August 1903, 21 August 1903, 28 August 1903, 18 September 1903; SAPP 55/1906.
- ³⁴ Mary Niemann cited in Forrest, *The Spirit of the Daly*, p. 36.
- ³⁵ *Ibid.*, p. 35.
- ³⁶ GRIC 12729.
- ³⁷ *NTT*, 9 February 1906, 23 March 1906, 25 May 1906, 16 November 1906, 23 August 1907, 27 December 1907, 8 May 1908, 25 September 1908.
- ³⁸ GRIC 12382, 12397, 12419.
- ³⁹ GRIC 12580.
- ⁴⁰ *inter alia* GRIC 12467 Thomas to Government Resident [hereafter GR] - bricks landed in wrong place; 12510 Thomas to GR: non-arrival of materials, broken bricks and closure of roads; 12580, 'roads impassable for a packhorse let alone a dray'; 12597 - 8 January 1904, 12591, Thomas to GR 28 January 1904, 12588 Thomas to GR, 20 January 1904, 12604, Bice, application for further leave; 12639 Thomas to GR, 18 February 1904; 12692 Thomas to GR 4 January 1904; 12700 Thomas to GR; 12701, 12751, Thomas to GR 29 March 1904; 12782 Thomas to GR 20 April, smelter shed completed.
- ⁴¹ GRIC 12729; Jones, *Pegging the Territory*, p. 134.
- ⁴² GRIC 12930, 13061; *NTT*, 13 May 1904, 8 July 1904; *Advertiser*, 15 April 1905.
- ⁴³ GRIC 12446, coal with wharfage quoted at 57s.6d a ton.
- ⁴⁴ GRIC 12874: one million gallons of water entered the mine daily during the worst of the Wet.
- ⁴⁵ GRIC 12744.
- ⁴⁶ GRIC 12782 letter to GR from London dated 12 March 1904 quoting report by F. Jolly, mining engineer of Melbourne - 'My impression is very favourable'; H. Roberts to GR letter dated 11 May 1904: reporting that the lode was 20 feet wide and had opened up for a distance of 400 feet but estimating that one million gallons of water daily had entered the mine in the 1904 Wet; *NTT*: 24 March 1901, 4 October 1901, 25 July 1902, 5 June 1903, 12 June 1903, 3 July 1903, 3 August 1904, 4 December 1903, 18 December 1903, 2 September 1904; Jenkins, SAPD, 14 September 1904. p. 464; GRR 1902, 1903; GRIC 12120: letter H. Roberts to GR dated 11 March 1904; GRIC letter H. Simpson, Secretary NTMS to GR 19 March 1904; 10233, 11830, 11961, 12874, 13165.
- ⁴⁷ *NTT*, 1 July 1904, 15 July 1904, 22 July 1904, 29 July 1904, 12 August 1904, 2 September 1904, 9 December 1904; J. McDonald, *Mining World* 24 May 1904 cited in *NTT*, 22 July 1904; Herbert, cited in *NTT*, 2 September 1904.
- ⁴⁸ GRIC 13216.
- ⁴⁹ *Inter alia*, GRIC 12931, 12943, 12949, 12983, 13232.
- ⁵⁰ GRIC 13353, 13422, 13431, 13443, 13453.
- ⁵¹ GRIC 15504.
- ⁵² *NTT*, 4 November 1904, 11 November 1904, 9 December 1904.
- ⁵³ GRIC 14052. The ore was later found to contain under three-percent of copper and both 'kaolin and sulphide ore [were found to be] deceptive in appearance' and unsuitable for the purpose'.
- ⁵⁴ GRIC 13674: letters 7 February, 14 February, 20 February 1905; 13675, 13767.
- ⁵⁵ *NTT*, 3 March 1905.
- ⁵⁶ GRIC 14257, 14261.
- ⁵⁷ *Copper: From Quarry to Cable*, Encyclopaedia Education Corporation Video, *passim*.
- ⁵⁸ GRIC, *inter alia*, 14091, 14100, 14102, 14104, 14105, 14106, 14108, 14109, 14268.
- ⁵⁹ GRIC 14257, 14261.
- ⁶⁰ *Copper Deposits in the Northern Territory*, Prepared by Eupene Exploration Enterprises, Department of Mines and Energy, 1989, p. 10.
- ⁶¹ *Ibid.*; later, Daly River Mine smelted copper was found to be free from bismuth and arsenic impurities, GRIC 15797.
- ⁶² GRIC 14051, 14261.
- ⁶³ GRIC 14092, 8 July 1905; GRIC 14108.
- ⁶⁴ GRIC 14921, Basedow to Minister, 24 March 1906; GRIC 15067 Dyson to GR; GRIC 16015; 16019; *NTT* 22 March 1907; GRR 1906; the lower percentage of copper was now viable with increased copper prices.
- ⁶⁵ *Ibid.*, 26 August 1904.
- ⁶⁶ 'Wild Cat Columns', *Bulletin* cited in *NTT*, 2 September 1904; Dashwood, GRR 1904; *Australian Trading World*, 1 December 1904, cited in *NTT*, 27 January 1905.

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- ⁶⁷ *Ibid.*, 17 February 1905.
- ⁶⁸ Solomon, SAPD, pp. 161-63, 2 August 1905.
- ⁶⁹ *Ibid.*
- ⁷⁰ Railway Commissioner, SAPP 54/1905.
- ⁷¹ Commissioner of Public Works, SAPD, 11 October 1905, p. 460; *NTT*, 20 October 1905, 2 August 1906; A.G. Pendleton, cited in SAPP 54/1905, p.1. Included in his objections was the large difference in railway rates of pay in the two provinces; the Territory representatives were up against an overarching South Australian policy that, as the Northern Territory was temporarily ceded to South Australia, it must be self supporting and all debts plus commission be debited to the Northern Territory account that was very high at this point.
- ⁷² GRIC 11941, letters from Bice, 23 March, 31 March 1903.
- ⁷³ *Australian Mining Standard* 23 February 1906, cited in *NTT*, 23 February 1906; 6 April 1906; 13 April 1906; 24 June 1906.
- ⁷⁴ 'Chief Warden Report', *NTT*, 30 June 1906; *ibid.*, 28 December 1906.
- ⁷⁵ GRIC 15419, Dyson to Acting Secretary of GR.
- ⁷⁶ Chief Warden reports in the GRR; *NTT*, 30 June 1906, 28 December 1906.
- ⁷⁷ *Ibid.*, 6 July 1906, 13 September 1907; E.C. Playford, GRR 1906; *NTT*, 25 January 1907, 23 August 1907, 20 December 1907; H.Y.L. Brown, SAPP 55/1906, 54/1907; GRIC 15419, 15310.
- ⁷⁸ 'G. Buttle', *NTT*, 28 January 1910; *Ibid.*, 7 November 1906, 9 August 1907, 23 August 1907, 19 June 1908, 26 June 1908, 30 October 1908.
- ⁷⁹ GRIC 14116, 14229, 14378.
- ⁸⁰ *NTT*: 3 March 1905, 25 August 1905, 4 August 1905, 22 September 1905, 26 January 1906; Le Hunte, Governor's Report, SAPP 49/05; GRIC, 14921.
- ⁸¹ GRIC 14427 13 November 1905; Jones, *Pegging the Territory*, p. 135.
- ⁸² GRIC 14000, Webber also produced metallic copper without producing matte; Aerial, Geological and Geophysical Survey of Northern Australia, p. 3, Table 1.
- ⁸³ *NTT*, 8 December 1905; GRR 1906; Jones, *Pegging the Northern Territory*, pp. 134-5.
- ⁸⁴ GRIC 14275, 22 July 1905, 26 July 1905, 11 August 1905, 19 September 1905, 6 October 1905; GRIC 14810, 9 February 1906; GRIC 14956, 2 March 1906; 1559, telegram to Dyson.
- ⁸⁵ GRIC 14956, Basedow to GR.
- ⁸⁶ *NTT*, 30 August 1906, 26 October 1906, 27 April 1906, 15 February 1907; GRIC 15595, Basedow to GR, 15 September 1906, 13 October 1906; *inter alia* J. Wilson in 14107; Basedow in 15067; GRR 1906.
- ⁸⁷ GRIC 15067, Basedow to GR, 13 April 1906; *ibid.*, telegram GR to Minister controlling the Territory, 17 April 1906; Herbert in GRR 1907.
- ⁸⁸ GRIC 15067, letters and telegrams 17 April 1906; 15887, 12 April 1907.
- ⁸⁹ GRIC 17005, 594 tons black sulphide ore averaging 21 per cent copper, 9 ozs silver, 1 dwt gold in 6 months of 1907.
- ⁹⁰ GRIC 15797, Hendrie & Bell to GR, 11 March 1907; GRIC 15246; 15321; 15387; 16013, 15 March 1907: Tamblyn's mine near Pine Creek railway had 20 per cent sulphur but 5 per cent arsenic and 1 per cent bismuth.
- ⁹¹ GRIC 15387; 15949, telegram 26 September 1907, circular dated 26 September 1907 and correspondence thereon (smelting rate for the Daly River syndicate was raised from £1.11.3 per ton and £2 for others to a flat £2.15s per ton overall, excluding fluxing charges), A.E. Jolly 29 August 1907: prices were falling and complaint was made especially as many final settlements were outstanding.
- ⁹² GRIC 15887, 16699.
- ⁹³ GRIC 15194, 30 April 1906; 15905, 29 January 1907; 16013 March, April, May and June 1907.
- ⁹⁴ GRIC 16699, Jolly to GR, 27 November 1907.
- ⁹⁵ Chief Warden's Report GRR 1907; Government Geologist GRR 1908; SAPP 55/1906; *NTT*, 2 August 1907, 20 September 1907, 13 December 1907, 3 April 1908, 24 April 1908, 6 June 1908, 12 June 1908, 9 October 1909, 13 December 1909.
- ⁹⁶ GRR 1907, 1908; GRIC 16699: A.E. Jolly - boat service was now 30 shillings a ton Darwin to Daly River and copper back at 25s a ton; 17297 June 1908: cartage smelter to landing was 12s per ton.
- ⁹⁷ GRIC 17998, owners to GR, 20 March 1909.
- ⁹⁸ GRIC 18427.
- ⁹⁹ Basedow in GRR 1909; Herbert GRR 1909; GRIC *inter alia* 11725, 12565, 12695, 14051, 14100, 14273, 14289, 14812, 14056, 16684, 16699, 17652: documents regarding the syndicate's release of 5 acres on which the smelter stood.
- ¹⁰⁰ *NTT*, 13 July 1906, 4 January 1907, 15 February 1907, 5 April 1907, 26 October 1907, 1 November 1907, 27 December 1907; Basedow, GRR 1907, Herbert, GRR 1907, 1909.

¹⁰¹ *NTT*, 9 February 1906, 23 March 1906, 25 May 1906, 16 November 1906, 23 August 1907, 27 December 1907, 8 May 1908, 25 September 1908, 20 November 1908; Basedow, GRR 1908; Herbert, GRR 1906, 1908, 1909; GRIC, J.H. Niemann's letter dated 20 May 1907; GRIC letter from J. Webber, 12 August 1905; H.A. Hunt, 'Results of Rainfall, Observations made in South Australia and the Northern Territory', pp. 212.

¹⁰² Jones, *Pegging the Northern Territory*, pp. 135-6; SAPP 55/1906: Brown's Report.

¹⁰³ GRIC 14052, the Daly River syndicate sold the smelter 3 tons of 35 percent carbonate ore 'a year or two ago' and in August 1905 it was still buried beneath other ores; *NTT*, 8 June 1906, 12 April 1907, 5 October 1907; GRIC 16219, 15998; 15365; 15937; 15130, Manager to Minister controlling the Northern Territory; 16006, letter from Chief Warden.

¹⁰⁴ Jones, *Pegging the Territory*, p. 133; GRIC 14392, the service reorganised in October 1905 when Mary Niemann, who worked well with the Aborigines, was living at the abandoned mission station.

¹⁰⁵ GRIC 16497; *NTT*, 25 September 1908.

¹⁰⁶ *Ibid.*, 28 December 1906, 10 July 1908, 25 September 1908, 30 April 1909; GRIC 18145 report from Basedow; GRIC 16369, letter from Niemann.